INSTITUT DE PHYSIQUE ET CHIMIE DES MATERIAUX DE STRASBOURG

***DE**partement **M**agnetisme des **O**bjets Nano**S**tructurés (**anct. GEMME)*

23, rue du Loess 67034 STRASBOURG Cedex 2

SEMINAIRE "DEMONS"

Mardi 8 décembre 2009 à 11h00 à l'Auditorium de l'IPCMS

S. Wu, J. Brunner, R. Huber, T. Gonzalez, J. Agustsson, J. Liao, Ch. Schöneneberger and ***M. Calame***

Department of Physics, University of Basel, Switzerland

Formation mechanisms and functionality in molecular junctions

Metal-molecule-metal junctions are of interest both for improving our fundamental understanding of electrical transport at the nanoscale and for the development of novel electronic devices. We address both aspects by studying two types of molecular junctions. On the one hand, we prepare and characterize individual metal-molecule-metal junctions using a mechanically controllable break junction technique working in a liquid environment. This approach is well adapted for studying basic transport properties. We investigate different molecular systems, from simple n-alkanedithiols to various conjugated oligomers and novel cruciform compounds designed to act as electro chemical switches. Recently, we observed the formation of molecular bridges induced by aromatic stacking between neighboring conjugated compounds trapped within a break junction. This particular aspect opens interesting perspectives for the realization of novel, synthetic electro-mechanical molecular switches. It also shows that the microscopic mechanisms at stake in the formation of molecular junctions remain only partially mastered to date, with a substantial work still needed, in particular on kinetic aspects.

In a complementary approach, we developed a template structure for the preparation of networks of molecular junctions based on the self-assembly and stamping of alkanethiol-coated metallic nanoparticles arrays. Dithiolated conjugated molecules can be subsequently inserted within such arrays via chemical exchange to form a network of molecular junctions. This methodology permits the fabrication of a large number of junctions in parallel and represents a valuable test platform for the development of molecular circuits. While possible applications based on such structures remain a long-term task, first results on nanoparticles arrays embedding active molecules ascertain the validity of the approach. We could recently demonstrate conductance modulation effects upon chemical oxidation and reduction as well as light-induced conductance switching in networks embedding respectively TTF-based compounds and diarylethene optical switches.

Pour tout contact : **Bernard DOUDIN** (Bernard.Doudin@ipcms.u-strasbg.fr)